भारतीय मानक
Indian Standard

IS 9439 : 2022

पानी के कुएँ वेधन प्रौद्योगिकी में प्रयुक्त पारिभाषिक शब्दावली

(दूसरा पुनरीक्षण)

Glossary of Terms Used in Water Well Drilling Technology

(Second Revision)

ICS 73.100.30

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www.bis.gov.in www.standardsbis.in

February 2022 **Price Group 4**

Diamond Core and Water Well Drilling Sectional Committee, MED 21

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Diamond Core and Water Well Drilling Sectional Committee had been approved by the Mechanical Engineering Division Council.

The standard was first published in 1980 and revised in 2002.

The standard has been revised to incorporate terminologies used in water well drilling technology.

The composition of the committee responsible for the formulation of this standard is given in Annex A.

Indian Standard

GLOSSARY OF TERMS USED IN WATER WELL DRILLING TECHNOLOGY

(Second Revision)

1 SCOPE

This standard cover definition/explanation of the terms generally used in water well drilling technology.

2 REFERENCE

The standard listed below contains provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated was valid. All standards are subject to revision, and parties to agreements are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

IS No.	*Title*
2800 : 2019	Code of practice for construction and testing of tubewells

3 TERMINOLOGY

A

3.1 Abandoned Well — A well which is no longer used. In many places, abandoned wells are filled with cement or concrete grout to prevent pollution of ground water bodies.

3.2 Acidic — Water or soil whose *p*H is below 7.0.

3.3 Acidizing — The process of introducing acid into the well or borehole for dissolving soluble material and later removal of the same to enlarge the cavities and remove encrustation from well screens and cementing from gravel/filter pack.

3.4 Additive — An auxiliary agent added for conditioning of drilling fluid to obtain desired physical properties.

3.5 Air Drilling — The drilling process in which air or gas is used as medium for removal of drill cutting from the bore.

3.6 Air Line — A small diameter pipe inserted in the well with or without ejector for developing the well with airlift/compressed air method.

3.7 Air Line Lubricator — An apparatus that feeds a controllable quantity of lubricator into the air stream to provide lubrication to pneumatic components/accessories of machine.

3.8 Air Rotary Drilling — A drilling method where compressed air is used as drilling media for lifting the formation cuttings from bottom of the hole.

3.9 Alkaline — Water or soil whose *p*H is above 7.0.

3.10 Alluvial — Relating to, composed of, or found in alluvium.

3.11 Alluvium — Sediments deposited by erosional processes, usually by streams.

3.12 Annular Space/Annulus — The space between the drill pipe and wall of the hole.

3.13 Annular Velocity — The up-hole return velocity of drilling fluid or air in the annulus usually expressed as m/min.

3.14 Antifoam — A chemical reagent added to acid to prevent or retard foaming during acidizing.

3.15 Aquifer — A formation, group of formations or part of a formation that contains sufficient saturated permeable material to yield economical quantities of water to wells and springs.

3.16 Artesian Well — A well driving its water from a confined aquifer in which the water level stands above the ground surface, synonymous with flowing artesian well.

3.17 Auxiliary Brake — A revolution retarder, used in conjunction with mechanical or air brake-generally installed on the draw works drum shaft.

B

3.18 Backpressure — A pressure that can cause water to backflow into the water supply when a user's wastewater system is at a higher pressure than the public system.

3.19 Bailer/Sand Bucket — A section of steel pipe fitted with a hook or a ring hook at one end and a valve on the other which is lowered into the borehole, cased or uncased, to remove formation cuttings and water.

3.20 Barytes — Barium sulphate, the commercial product contains small amounts of iron oxide, silica and other minerals. It is mixed with drilling fluid to increase its density for better lifting of formation cuttings.

3.21 Bentonite — A finely powdered highly plastic, colloidal clay used in preparing drilling mud, which is mixed with water to prepare drilling fluid.

3.22 Bit — A cutting tool attached to the bottom of drill string/stem for cutting the rock formation.

3.23 Bit Breaker — A heavy steel plate which fits in the rotary table and holds the bit while it is being unscrewed from the drill stem.

3.24 Bit Nozzle — A fluid porthole in the bit.

3.25 Blowout — A sudden and violent escape of gas, oil or water from a borehole being drilled when high pressure is encountered.

3.26 Borehole — Any hole bored or drilled in the land for prospecting/production of oil, mineral or water.

3.27 Blowout Preventer — A device attached immediately above the surface casing to prevent the blowout.

3.28 Breakout — The act or process of unscrewing a threaded joint between the drill pipes, casings etc. while with drawing them from the borehole.

3.29 Bridge — An obstruction to circulation in the annulus. It is usually formed by caving of the wall of the hole or by intrusion of large boulder or within filter pack during gavelling and development.

C

3.30 Cable Tool/Percussion Drilling — A form of well drilling that is accomplished using a weighted string of drilling tools attached to hoisting cable that is repeatedly lifted and dropped. The force of the impact crushes the material at the bottom of the borehole. The crushed material is periodically cleared using a bailer. Also *see* IS 2800.

3.31 Casing Pipe — Steel or plastic pipe lowered in the borehole to protect it from collapsing. The casing is driven into the borehole to seal it off from surface water contamination.

3.32 Casing Shoe — A heavy wall steel coupling or band at the bottom most part of the lowest casings for smooth travel during driving of the casing pipes.

3.33 Cathead — A auxiliary hoisting device used for handling light loads and for lifting and dropping tools or making and breaking joints. It is also used during hammering process.

3.34 Catline — Hoisting or pulling line used in conjunction with cathead to lift heavy equipment and tools.

3.35 Catwalk — A ramp on the side of a rig, fitted to the derrick floor, where the pipes are laid using the cat line.

3.36 Cementing/Grouting — It is the act of injecting certain substances mostly slurry of cement into the annulus between the casing and drilled hole. This secures the casing in place and excludes undesired water and other fluids from the well bore.

3.37 Cement Plug — A hardened cement slurry at the bottom of the casing pipe. It is later drilled through, when the cement is set.

3.38 Cement Slurry — A mixture of cement and water used for pumping inside the bore hole for the purpose of grouting the bore hole.

3.39 Circulate or circulation — To pump drilling fluid through the drilling stem and back to the surface through the annulus or down the annulus to bottom of hole and back to surface through the drill stem. It applies to circulate the drilling fluid when drilling is suspended to collect formation samples from the bottom of the hole, or the drilling is suspended for unseen reasons or awaiting other operations.

3.40 Collector Well — A well located near a surface water supply used to lower the water table and thereby induce infiltration of surface water through the bed of the water body to the well.

3.41 Control Console — Horizontal or vertical panel on which the operator's controls are located.

3.42 Core — It is a cylindrical shaped sample of the undisturbed formation obtained from the bottom of the hole.

3.43 Coring — The act of obtaining an undisturbed sample (core) of the formation using a core barrel.

3.44 Core Barrel — It is used to obtain core of the formation. Single tube, double tube and triple tube core barrels which are available.

3.45 Crown Block — An assembly of wire line sheaves mounted on the uppermost portion of derrick or mast.

3.46 Cuttings — Particles of the formation generated due to the cutting action of the bit at the bottom of the hole.

D

3.47 Derrick/Mast — A vertical steel frame of sufficient height on the rig that has pulleys on the top for hoisting and lowering of drill string and also support the crown block, top drive, pull down chains, etc.

3.48 Deadline — Refers to the end of the drilling line, which is not reeled on the drum. This end is anchored to the mast substructure and does not move up or down during various operations.

3.49 Die Overshot — It is tool shaped as a long-tapered die of heat-treated steel designed to fit over the top of the fallen drill pipe. It can be rotated to cut threads on the fallen pipe and fish it out.

3.50 Dilution — To add water to the cement slurry or the drilling fluid (mud) so that it can easily be pumped.

3.51 Direct Circulation Rotary Drilling — Under direct rotary drilling method the borehole is drilled by rotating a bit and cuttings are removed by circulation of drilling fluid pumped in through drill stem. Also *see* IS 2800.

3.52 Down the hole drilling — It essentially involves a pneumatic hammer at the bottom of a drill string. It relies on three elements for drilling holes: bit load, rotation, and air. These active elements combine to achieve crushing of rock formation. As the drill string slowly rotates, the drilling hammer is forced into the rock repeatedly. Striking power is provided by compressed air driving a piston inside the hammer.

3.53 Drag Bit — A rotary bit that has two or more cutting blades with hard faced cutting edges. It is used for fast penetration in unconsolidated or semi consolidated sediments.

3.54 Drawdown — The drop in the water table or level of groundwater when water is being pumped from a well; the amount of water used from a tank or reservoir; the drop in the water level of a tank or reservoir.

3.55 Draw Works — A power driven winch or winches equipped with clutch and brakes for controlling hoisting and lowering of drill string or casing pipe etc.

3.56 Drill Collar — A heavy drill pipe attached immediately above the drill bit to put weight on the bit for steady drilling and minimization of deviation of the borehole.

3.57 Driller — A technical person who operates the drilling machine/rig.

3.58 Drilling Mud — It is a type of drilling fluid prepared by mixing bentonite or similar clays in water and maintaining a consistency in gel strength and viscosity.

3.59 Drill Pipe — Special heavy-duty seamless tubing with tool joints. Each joint is equipped with tool joint pin on one end and a tool joint box on the other for easy connection with other drill pipe. These are attached to the bit/ drill collar on one end and the kelly on the other to transmit rotational action from the rig to the bit. The drill string consists of drill pipe also convey drilling fluid to cool the bit and remove the cuttings from the bottom of the hole.

3.60 Drill String/Stem — Depending upon the type of drilling all components attached in a line from the bit at the bottom to the sub/adopter, drill collar, drill pipe connected to the machine on the surface form a drilling string.

3.61 Drive Bushing — Devise used for transmitting torque from the rotary table/drill head to the kelly and still allowing vertical movement of kelly as drilling progresses.

3.62 Drive Head — A sub fastened to the top of casing pipe to take the blow of drive weight.

3.63 Drive Pipe — A pipe or casing driven through the over burden.

3.64 Drive Weight, Hammer or Block — Used in percussion drilling to give blows on top of the casing to drive it into the formation.

3.65 Dry Hole/Duster — A well with no productivity.

3.66 Dust Collector — A device attached to an air drilling rig for collecting dust or cuttings during its operation.

3.67 Dust Diverter — Collar and hose attached to the air drilling rig to divert dust and cutting away.

E

3.68 Elevators — Device that latch around the drill pipe/casing, attached by links to the travelling block for raising or lowering the drill pipe or casing pipe from or into the borehole.

3.69 Expansion Reamer — A cutting tool that can be expanded or contracted by hydraulic or mechanical means; used to enlarge or ream the borehole below the casing pipe. It is also called adjustable or under reamer.

F

3.70 Feed — Process of applying required pressure on the bit to obtain downward movement.

3.71 Fish — The object or tool that is broken off or dropped in the hole is called the fish.

3.72 Fishing — The act of retrieving the fish is called fishing.

3.73 Fishing Tools — Various tools used to fish out the dropped or broken left out part of the drill string. Examples are taper tap, die collar, junk mill with fishing neck, releasing and circulating over shot with basket grapple, magnet and releasing spear with bull nose nut etc.

3.74 Fishing Magnet — A special powerful magnet attached to a rope or drill string to fish out iron or steel material from the borehole.

3.75 Fishing Tap — A tap of a heat-treated steel designed to fit on the top of the lost drill pipe to cut thread when rotated and gets tightly fitted to the fish.

3.76 Filter Cake — The suspended solids that are deposited on the borehole wall especially on porous medium.

3.77 Filter/Gravel Pack Material — Sand or gravel that is smooth, uniform, clean, well rounded and siliceous. It is placed in the annulus of the well between the borehole and well screen to prevent formation material from entering the screen.

3.78 Foot Valve — A type of check valve that is attached to the end of the suction pipe of the pump in well. to prevent the backflow of water into the well while allowing the pump to suck water from the well.

G

3.79 Gel Strength — It is a measure of drilling fluid's ability to support suspended particles when the fluid is at rest.

3.80 Gravel Well — A type of water well where the casing is set in an unconsolidated mixture of rock fragments or pebbles.

3.81 Ground Water — Water within the earth that supplies wells and springs; water in the zone of saturation where all openings in rocks and soil are filled, the upper surface of which forms the water table.

3.82 Grout — A cement slurry of a consistency that can be forced into a borehole through a pipe and placed at desired depth interval.

3.83 Grouting — It is the act of injecting certain substances mostly slurry of cement into the annulus between the casing and drilled hole. This secures the casing in place and excludes undesired water and other fluids from the well bore entering the screen.

H

3.84 Hoisting Line — Wire rope used on the draw works to hoist or lower the drill string.

3.85 Hole — Same as bore hole or well bore.

3.86 Hook Load — It is used to measure the maximum hoisting capacity of the machine.

I

3.87 Idler — On the drilling rig, an idler pully or sprocket is provided in connection with belt drive or chain drive to maintain desired tension in the belt or chain.

3.88 Impression Block — It is a block to obtain an impression of the top of the fallen material (fish) in a bore for choosing fishing method.

J

3.89 Jet — A directed, rapid flow of fluid from a nozzle.

K

3.90 Kelly — It is a square, hexagonal or round with a lengthwise groove or flute cut into the outside wall, with an inside hole. It is joined with swivel at the top and drill pipe below the square, hexagonal or grooved circular section engage the rotary table so that the rotation of the rotary table is transmitted to drill string.

L

3.91 Loss of Circulation — The loss of drilling fluid inside the bore hole while drilling. This is due to the nature of formation encountered or crevices.

3.92 Lead Packer — it consists of lead moulded on to a coupling or weld fitting. It is expanded by sewage block to make tight sand seal between two different sizes pipes.

M

3.93 Making a Joint/Connection — The act of adding of a new drill pipe on the drilling string suspended in the bore hole.

3.94 Marsh Funnel — A calibrated funnel used in determining the viscosity of the drilling mud/fluid.

3.95 Master Bushing — Adopter to reduce the opening size of the rotary table to accommodate various sizes bushings, slips etc.

3.96 Mud Balance — An instrument consisting of a cup and graduated arm with sliding weight and resting on a fulcrum for measurement of mud weight.

3.97 Mud Gun — A pipe fitted to the mud pump through a hose that can throw a jet of water or drilling mud under high pressure back into the mud pit to mix the additives and stir the mud for better consistency.

3.98 Mud Mixing — Preparation of drilling fluid by mixing water and bentonite and other required additives.

3.99 Mud pit — It is a pit/sump which is dug at a drilling site close to the drilling machine for the purpose of mixing the mud with the water for its circulation inside the borehole with the help of a pump. Normally 2 or 3 mud pits are made at a drill site. One for the purpose of mixing the mud for allowing it to swell for the desired period. And another pit is for the purpose of collecting the return fluid from the borehole. The return mud collected in this pit is again discharged in the main pit through hydrocyclone.

3.100 Mud Pump — A large double acting duplex pump used for circulation of mud in the borehole.

N

3.101 Nozzle — A small spout to direct the flow of fluid efficiently.

O

3.102 Overburden —The rock/soil mixture that sits atop bedrock. It can be comprised of rock, clay, gravel, sand or soil. This is sealed off from the well by the well casing, except in the case of gravel wells, where the casing ends in the gravel formation.

P

3.103 Penetration rate — The rate at which the bit proceeds in deepening of the borehole.

3.104 Permeability — The ability of a water bearing material to transmit water. It is measured in terms of quantity of water passing through a unit cross section, in a unit time, under 100 percent hydraulic gradient.

3.105 *p*H — Numeric value that describes the intensity of the acid or basic (alkaline) conditions of a solution. The *p*H scale is from 0 to 14, with the neutral point at 7.0. Values lower than 7 indicates it is acidic in nature and greater than 7.0 indicates it is basic in nature. Technically, *p*H is the logarithm of the reciprocal (negative log) of the hydrogen ion concentration (hydrogen ion activity) in moles per litre.

3.106 Pipe Handling Equipment — Equipment for storing, adding and removing of drill pipe.

3.107 Power Take Off — The mechanism of transmitting power from the engine to the other components of the drilling rig. It is usually accomplished by a separate shifting arrangement in the transmission.

3.108 Pull Down — It is defined as follows:

a) Thrust or weight applied to the bit through the drill string and
b) The mechanism which provides either the hoisting or pulling power.

3.109 Pump — A device which increases the pressure of the fluid moving through it.

R

3.110 Reamer — Cutting tool or bit used for enlarging the diameter of the borehole.

3.111 Reaming — The act of enlarging the diameter of the borehole during drilling operation.

3.112 Reverse Circulation Rotary Drilling — In reverse circulation rotary drilling, flow of drilling fluid, which is generally water, is reversed when compared with direct rotary method. The drilling fluid and its load of cuttings move upward inside the drill pipe and are discharged by the pump into a settling pit. Also *see* IS 2800.

3.113 Rig — A machine used for drilling a borehole.

3.114 Rotary Drilling — A form of well drilling where a turning hammer assembly or a roller bit is incrementally lowered into the ground to create the borehole. A lifting agent is continually pumped through the hammer to remove drillings from the borehole. This can be comprised of an air/water mixture, an industrial drilling fluid, or mud. Time required to drill a well is drastically reduced compared to cable tool methods.

3.115 Rotary Drive — It is a power shaft to transmit driving power to the rotating element.

3.116 Rotary Hose — A hose that leads from the stand pipe to the swivel, also called fluid or swivel hose.

3.117 Rotary Table, Power Swivel or Top Head Drive — It is a rotational unit that transmits the rotation to the kelly and ultimately to drill string and bit.

S

3.118 Safety Hook — A hook with a spring-loaded latch that prevents the load from accidently slipping off the hook.

3.119 Sand Content — Percentage of sand in the bentonite or additives to drilling fluid/mud.

3.120 Sewage Block — It is made up of steel as a circular block with lower half tapering to smaller diameter. It is used to expand the lead packer.

3.121 Shale Shaker — A vibrating screen/mesh that removes coarser cuttings from the circulating fluid before it enters the mud pit.

3.122 Sheaves — Disc type or wheel type parts of the travelling block or crown block with circumference grooved for a selected diameter of wire rope. These can be mounted on bushings or bearings.

3.123 Slips — Wedges used to hold the drill or the casing pipes and prevent them from slipping through the opening in the rotary table when the bit is lifted from the bottom or when adding or disjoining a drill pipe/kelly. These may be power or hand actuated.

3.124 Settling Pit — These are the small pits made on the path of the return drilling fluid for the purpose of settling of the cuttings before reaching the main mud pit.

3.125 Stabiliser — These are bars or rollers fitted (welded) around the drill collar for more effective drilling straight bore holes.

3.126 Stand Pipe — A vertical pipe or hose fixed approximately to the middle of the mast and connected to the mud, rotary or swivel hose for carrying drilling fluid/air.

3.127 Sub/Adopter — It is used to facilitate the connection between two different diameter pipes. A sub is normally provided between the bit and the lowest drill pipe. It is also small in length and provided with a pin at one end and a tool joint box on the other.

3.128 Submersible Pump — A type of well pump that resides inside the borehole. A submersible pump can draw water from a much lower depth than a shallow well pump because it pushes the water up and out the well, rather than pulling it from the well at the surface level.

3.129 Swivel — A device that permits the passage of mud or air from stationary hose into the rotating Kelley or drill pipe.

T

3.130 Thinner — A substance mixed with mud to reduce its viscosity and gel strength without lowering the density.

3.131 Travelling Block and Crown — A block with pulleys for wire ropes and a hook at the base used for lifting and lowering of drilling pipes, kelley etc.

3.132 Thread Protector — These are small cup like device put on or into the ends of the drill pipe, subs, stabilizers and on top end of bits to protect the threads from damage mainly during transportation.

3.133 Tong — Tong is a kind of tool for making or breaking a joint of pipe similar to a pipe wrench.

3.134 Tool Joint — Threaded part of a drill pipe which is box type on one end and pin type on the other.

3.135 Transfer Case — A transmission junction to distribute power from engine to various sections of the rig.

U

3.136 Unconsolidated Formations — Naturally occurring earth formations that have not been lithified. Alluvium, soil, gravel, clay, and overburden are some of the terms used to describe this type of formation.

W

3.137 Wall Hook — It is fishing tool made of casing pipe with small cut sections on the pipe in the rectangular shape with one circumferential side not cut and then pushing the cut sides into the pipe to protrude into it. Four such sections at 90 degrees form a reduced diameter opening in the centre of the pipe. This pipe is lowered in the hole to catch the fish by centering it.

3.138 Water Injection System — Used for adding water to the down hole air stream for increasing efficiency of cleaning action. Also, used for controlling dust in the hole.

3.139 Water well — A bored, drilled, or driven shaft or a dug hole whose depth is greater than the largest surface dimension and whose purpose is to reach underground water supplies to store or bury fluids below ground.

3.140 Well Screens — A filtering device that serves as the intake portion of tube wells constructed in unconsolidated or semi-consolidated aquifers to permit water to enter the well structure. It is a filtering device used to prevent sediments from entering a water well.

3.141 Wetting Agent — Additive that reduces surface tension.

3.142 Water Table — Level below the earth's surface at which the ground becomes saturated with water. The surface of an unconfined aquifer which fluctuates due to seasonal precipitation.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Diamond Core and Water Well Drilling Sectional Committee, MED 21

Organization	*Representative (s)*
Geological Survey of India, Kolkata	Shri Ajay Agarwal (***Chairman***) Shri Anup Kumar Johri (*Alternate*) Shri S. Shankar (*Young Professional*) Shri C. B. Tiwari (*Young Professional*)
AMKO Mining And Drilling Equipment Pvt Ltd, Mumbai	Shri M. G. Kuvawala Shri H. M. Kuvawala (*Alternate*)
AQSEPTENCE Group (India) Pvt, Ltd (Formaly known As Johnson Screens India Pvt, Ltd)	Shri Rakesh Arora Shri Anil C. Shah (*Alternate*)
Atlas Copco (I) Ltd Pune	Shri Shudhanshu Nigam Shri S. Datta Majumdar (*Alternate*)
Atomic Minerals Directorate for Exploration and Research, Hyderabad	Shri P. S. Chattopadhyay
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Central Mine Planning and Design Institute Limited, Ranchi	Shri Anil Savanur Shri A.V. Ramakrishna (*Alternate*)
Central Water Commission, New Delhi	Shri Ramjeet Verma Director (*Alternate*)
Drilbits International Private Limited, Nashik	Shri Y. V. Ramana Murthy Shri Tushar Paul (*Alternate*)
Drillmax Rigs Pvt Ltd, Mumbai	Shri R. K. Bijlani Shri R. B. Desai (*Alternate*)
DTE of Mines and Geology, Udaipur	Shri N. K. Parihar Shri N. K. Jonwal (*Alternate*)
Epiroc Mining India Limited, Nashik	Shri Sujeet Kumar Shri Chandan Ghosh (*Alternate*)
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Indian Institute of Technology, Roorkee	Prof B. K. Gandhi Shri Varun Kumar Sharma (*Alternate*)
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Mecon Limited, Jharkhand	Shri B. K. Sinha
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This Indian Standard has been developed from Doc No.: MED 21 (14792).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi